

BERVE CO.

## PATENT SPECIFICATION



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151,692

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### PROVISIONAL SPECIFICATION.

#### Improvements in or relating to the Moulding of Concrete Products, such as Blocks, Panels, Structures and the like.

We, JOHN WOOLCOCK, Works Manager, and WILLIAM JOHN STEWART, Building and Engineering Contractor, both of 42, Abchurch Lane, London, E.C. 4, do hereby declare the nature of this invention to be as follows:—

This invention relates to moulding surfaces or formwork for concrete construction of all kinds and more particularly cases in which the concrete is mixed such a consistency that it may be poured into the moulding, and where it is desirable that the retaining or moulding surfaces be removed as quickly as possible as, for example, in repetition of production.

In moulding concrete as at present generally carried out, wood or metal in the majority of instances constitutes the contacting surfaces, and the amount of adhesion between the concrete and such material often prevents the removal thereof without damage until a considerable period has elapsed after casting.

The skin friction also presents considerable difficulties in the way of removal in a parallel direction by sliding the surface over the other, thus often necessitating the use of expensive, collapsible or detachable structures, or the provision of objectionable tapering, particularly where cores for apertures or hollow elements are required.

The object of the present invention is to overcome the foregoing difficulties and to provide for the execution of concrete moulding in an expeditious and improved manner.

The invention consists broadly in the use of india-rubber or material having

similar properties for the contacting surfaces when moulding concrete elements or structures.

The invention further consists in the use of hollow forms of rubber or the like which may be provided with interior supporting means for the production of apertures, cavities or the like in concrete constructions.

The invention further consists in a method of forming concrete elements or structures by applying concrete of a consistency which may be poured in or upon moulding surfaces of rubber or the like.

The invention also consists in the improved methods of and/or means for forming or casting concrete as hereinafter indicated.

In the application of the invention to the formation of hollow bodies, apertures or holes of cylindrical or corresponding form, instead of employing tapered or collapsible cores as is at present generally done, the core is formed of a rubber tube which may be temporarily supported in position upon a metal or wooden rod or bar or a spiral form or similar light structure. Alternatively, the form of the rubber tube, particularly when cylindrical, may be preserved by a gaseous fluid or liquid temporarily inserted therein.

The concrete is cast around the suitably supported core, and immediately the initial set has taken place or within an hour or two of casting, the support may be withdrawn and the rubber tube or the like can then be easily drawn out in an axial direction, the natural contraction of the rubber under tension giving the

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necessary clearance and the nature of the rubber surface precluding the cohesion which is found to exist with wood or metal surfaces.

- 5 In this way holes of quite small diameter and considerable length may be formed perfectly parallel and the cores withdrawn for use in other positions in a comparatively short time and without any possibility of damage to the concrete.

- 10 It is also possible to form cavities the size of which increases within the opening aperture, as a core after the interior support has been removed readily collapses for withdrawal through the smaller opening.

- 15 For the formation of hollow walls, cores of the correct width may be positioned between the formwork and pulled upwards as the concreting proceeds, the cores being of suitable dimensions for one day's operation and being drawn the next morning and immediately re-utilised.

- 20 For the formation of chimney flues, conduits or the like, cores formed in the manner indicated are easily adapted to the formation of straight, inclined or curved passages as the material will accommodate itself to temporary supporting means and may be further supported by gaseous or liquid matter to maintain its shape against the pressure of the concrete until the initial set has taken place.

For all kinds of pre-cast elements such

as hollow or solid blocks, panels or the like, rubber or material having similar properties may be used as a veneer for shuttering or like removable portions, an open frame being provided as a support for the shuttering, so that it may be easily removed as soon as the initial set has occurred, while the shuttering is left in position as a protection to the wet concrete until this is dried sufficiently for the parts to fall away or be readily removed.

By operating in accordance with this invention, not only may all formwork, moulds, cores and the like be utilised to a far greater extent than where the concrete has to be left until it is sufficiently matured to withstand the strain of removing ordinary formwork, but a far better surface is produced and the maturing or seasoning is very rapidly effected owing to the actual surface of the concrete being exposed much more quickly than under ordinary conditions.

It is to be understood that the examples given constitute only some application of the invention, and that modifications and additions may be introduced without in any way departing from the spirit of this invention.

Dated this 20th day of June, 1919.

MARKS & CLERK.

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### COMPLETE SPECIFICATION.

#### Improvements in or relating to the Moulding of Concrete Products, such as Blocks, Panels, Structures and the like.

- We, JOHN WOOLCOCK, Works Manager, and WILLIAM JOHN STEWART, Building and Engineering Contractor, both formerly of 42, Albemarle Street, London, W. 1, now of 12, Berkeley Street, London, W. 1, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- This invention relates to moulding surfaces or formwork for concrete construction of all kinds and more particularly to cases in which the concrete is mixed to such a consistency that it may be poured into the moulding receptacle or the like. It is further of advantage where it is desirable that the retaining or moulding surfaces be removed as quickly as possible, as for example, in repetition production.

In the production of artificial stone

slabs, it has been suggested to cover the bottom plate of a mould with a yielding auxiliary surface impervious to water and air formed, say of rubber, oilskin or other prepared textile material. It has also been proposed to coat the surface of shuttering for use in the construction of ferro concrete hulls with rubber compounds which are applied in the plastic or uncured state and then vulcanized or cured *in situ*.

The use of an inflated bladder has been proposed for the manufacture of hollow blocks or bricks from cement mixtures; and it has also been proposed to form a hollow column in a mould round a core, formed of an indiarubber pipe inflated with air and into which additional air may be subsequently injected in order to compress the cement wall of the column.

For forming channels, drains or the

like, it has been suggested to employ spirally devisable centrings or cores made from a strip or ribbon of metal or other material which, after the concrete is set is withdrawn by an endwise pull which unwraps the spiral, the proposal also comprising lining a conduit if desired with non-conducting material by coating the spiral with hard rubber which is left behind when the unwrapped spiral is withdrawn. A wire coil which may be covered with paper or the like has also been proposed in a similar connection.

When any part of a moulding device is separated from the moulded product by withdrawal parallel to a surface thereof there is considerable skin friction and possibility of damage unless clearance can be provided between the moulding and the moulded surfaces.

The object of the present invention is to provide for the automatic production of such clearances.

The invention consists in a method of moulding concrete products by the employment of rubber or material having similar properties for the moulding surfaces, according to which the reduction in the thickness of the rubber under the tension of withdrawal or the small determined contraction of a core or other part in the absence of supporting means is utilised for obtaining sufficient clearance to permit separation of the moulding and moulded surfaces by parallel or sliding movement without damage thereto.

The invention also consists in the improved methods of and/or means for forming or casting concrete as hereinafter described.

Referring now to the accompanying drawings:—

Figures 1 and 2 show a sectional plan and elevation of apparatus for forming concrete building blocks in accordance with the invention.

Figures 3 and 4 show another application of the invention to the formation of chimney flues or the like.

Figure 5 is a sectional plan showing the application of the invention to the formation of hollow concrete walls.

Figure 6 is a cross section showing the application of the invention to the construction of reinforced concrete pipes or drains.

When operating in accordance with the invention as shown by way of example in Figures 1 and 2, hollow concrete blocks *a*, for use in reinforced concrete structures are formed in moulds as hereinafter described.

Upon the moulding floor *b* there is

erected a series of longitudinal partition plates *c* which may be of a length sufficient to accommodate any convenient number, say up to about six blocks positioned end to end, and between these are inserted transverse partitions *d* formed of a continuous series of short division plates inserted between the longitudinal partitions *c*, the whole being retained in position by the bottom pallets or members *e* which may correspond in length with the plates *c*.

Running longitudinally of the compartments along the bottom angles are inserted filling blocks *f*, *f*<sup>1</sup> faced with a veneer *g*, *g*<sup>1</sup> of rubber or material having similar properties and in the upper corners of the compartments similar filling blocks *f*<sup>2</sup>, *f*<sup>3</sup> faced in the same manner at *g*<sup>2</sup>, *g*<sup>3</sup> are also inserted, said filling blocks advisably being attached to the partitions *c*.

To form the cavities in the blocks central cores *h* and additional cores *i* above and below the central cores are carried upon suitable supports, said cores being all formed of tubes of rubber or like material supported upon contour determining filling in the shape of wooden or metal rods or bars as shown at *j*, *k* and *l* or upon helical spring members *m* or *n*.

The filling rods or helical members are carried through the transverse partitions *d* by means of which they are supported, the rubber or like being also in continuous lengths if desired.

As soon as the concrete mixture has been filled into the moulds and the initial set has occurred, the filling members such as *j*, *k*, *l*, *m* or *n* may be immediately withdrawn and the partition plates removed from all accessible portions of the collection of blocks.

The exterior blocks are then easily taken away by manipulation of the bottom pallets or members *e* and as soon as a block is separated and in a sufficiently dried condition, the corner filling blocks *f*, *f*<sup>1</sup>, *f*<sup>2</sup> and *f*<sup>3</sup>, together with the central and smaller rubber cores *h* and *i* may be withdrawn, each block remaining upon its supporting bottom member *e* until it is sufficiently matured for handling and stacking.

Another way of separating the blocks when supported upon longitudinal continuous pallets is to withdraw all the supports and cores from each succeeding longitudinal series and as each set are drawn, to move the series together with the pallet transversely away from the remainder so as to expose the next longi-

tudinal partition plate *c*, the transverse partition plates may then be freed and withdrawn by curving the pallet over a convex bed or suitable supporting means.

5 By the employment of the rubber facing veneer *g*, *g*<sup>1</sup>, *g*<sup>2</sup> and *g*<sup>3</sup> upon the corner filling blocks, it is possible by the provision of thickened portions at the corners  
10 *o*, *o*<sup>1</sup>, *o*<sup>2</sup>, *o*<sup>3</sup> to provide for perfectly square corners, as the thickened portions of the rubber or like material will be extended by withdrawal sufficiently to cause a thinning of the material and easy separation from the concrete without breaking the  
15 corner.

In the application of the invention to the formation of any hollow bodies, apertures or holes of cylindrical or corresponding form, as hereinbefore described,  
20 instead of employing tapered or collapsible cores as is at present generally done, the core is formed of a rubber tube which may be temporarily supported in position upon a metal or wooden rod or bar or a  
25 spiral form or similar light contour determining structure. Alternatively, the form of the rubber tube, particularly when cylindrical, may be preserved by a gaseous fluid or liquid temporarily inserted and  
30 under sufficient pressure confined therein by a non-extendable lining or the like.

The concrete is cast around the suitably supported core, and immediately the initial set has taken place or within an  
35 hour or two of casting, the support may be withdrawn and the rubber tube or the like can then be easily drawn out in an axial direction, the natural contraction of the rubber under tension giving the  
40 necessary clearance and the nature of the rubber surface precluding the cohesion which is found to exist with wood or metal surfaces.

In this way holes of quite small  
45 diameter and considerable length may be formed perfectly parallel and the cores withdrawn for use in other positions in a comparatively short time and without any possibility of damage to the concrete.

50 For all kinds of pre-cast elements such as hollow or solid blocks, panels or the like, rubber or material having similar properties may be used as a veneer for shuttering or like removable portions, an open frame being provided as a support  
55 for the shuttering, so that it may be easily removed as soon as the initial set has occurred, while the shuttering is left in position as a protection to the wet concrete until this is dried sufficiently for  
60 the parts to fall away or be readily removed.

Figures 3 and 4 show the application

of the invention to the formation of chimney flues, the flues *p* and *q* being carried up in the concrete wall as the building proceeds and the core pieces *r* or *r*<sup>1</sup> consisting of tubes of rubber or similar material of a length sufficient for the height of work which will be executed in one day supported upon contour determining filling members which may be of rigid construction for the straight portions of the flues or of a flexible nature such as helical springs for any portions which are to be curved, the filling of the cores being conveniently fitted with handles *s*, *s*<sup>1</sup> by means of which they may be drawn up and re-positioned for proceeding with the work.

Figure 5 shows the application of the invention to the formation of hollow concrete walls which may be reinforced or not as desired. In this case the rubber cores *t* or *u* are made in lengths sufficient for a day's operation and are supported upon suitable hollow contour determining filling members *v*, *w*, which may be positioned from rods *x* engaging cross pieces *y* at the ends of the fillings. Where a rigid filling is employed, these may be drawn upwards upon the rod while the concrete is still wet without difficulty, the rubber being left for removal at a later stage, or the rubber may be supported upon helical filling which may be withdrawn in the most convenient manner.

For pipes, drains or sewers or the like, cores as hereinbefore described are easily adapted to the formation of the straight  
inclined or curved passages, as the material of the core may be made to accommodate itself by the use of temporary or other supporting means.

Figure 6 shows a transverse section  
1 through a pipe line or sewer constructed in accordance with this invention in reinforced concrete.

In this figure a trench 1 is taken out to the required depth and is boarded as  
1 shown at 2 to the exterior width of the pipe structure. The bottom is then filled with sufficient concrete to form the lower wall of the pipe and a hollow determining the exact alignment is prepared therein,  
1 say for example, with suitable invert blocks 3 or strickling from screeds at suitable intervals throughout the length.

A core 4 formed of a tube of rubber or material having similar properties and  
1 of a length which may conveniently be drawn in an axial direction is then placed in position along the hollow, said core being either supported upon a helical or like withdrawable metal skeleton form 5  
1 or alternatively filled with liquid or pre-

ferably gaseous fluid at a sufficient pressure to maintain its contour in opposition to any force which may be exerted by the concrete surrounding the core. Where a filling of fluid under pressure is employed, the tube is provided with a non-extendable lining of fabric or other material so proportioned that it will permit the core to extend to the desired dimensions under pressure, but will prevent these dimensions from being exceeded with any pressure which is found necessary to withstand the external pressure of the concrete.

Where reinforcement as shown at 6 in the drawing is employed, the whole or lower part of the circumferential members are inserted in the concrete first placed in the bottom of the trench, together with the lower longitudinal reinforcement, the remainder being if desired added after the hollow has been formed in the bed and the core placed in position. As soon as the core is correctly positioned the trench may be filled with the remainder of the concrete which is formed to the desired exterior shape upon the upper side.

As soon as the concrete is sufficiently set the filling, if of a fluid nature, is released and the core withdrawn in an axial direction to be again employed for the production, if required, of a further length of pipe.

Where the core is supported upon a helical or like metallic or other filling, the withdrawal may be effected by first removing the filling and then the rubber tube, or in some instances the filling may be so constructed that the tension applied for withdrawal will produce a contraction in the diameter, and in such circumstances it may be possible to attach the rubber tube to the filling and withdraw both simultaneously.

For small and moderate sized pipes where cheap and rapid construction is desirable, a trench may be taken out of the required dimensions of the pipe and a bottom layer of concrete inserted and strickled to form the positioning hollow. A fluid supported core lined as hereinbefore described may then be placed in position and the remainder of the trench filled in, the fluid pressure being released and the core withdrawn for re-use immediately the initial set has occurred. In cases where pipes are situated above ground level, a channel formed of boarding or other suitable formwork may be employed in place of a trench.

The invention is particularly applicable to the formation of cavities, the size of

which increase slightly within the initial opening aperture. Such cores for a small increase in dimensions may be merely hollow and supported by their own resistance to deflection, and be withdrawn as soon as the concrete is sufficiently set by reason of the contraction which takes place upon sufficient force being applied to pull out the core.

By operating in accordance with this invention, not only may all formwork, moulds, cores and the like be utilised to a far greater extent than where the concrete has to be left until it is sufficiently matured to withstand the strain of removing ordinary formwork, but a far better surface is produced and the maturing or seasoning is very rapidly effected owing to the actual surface of the concrete being exposed to the atmosphere much more quickly than under ordinary conditions.

It is to be understood that the examples given constitute only some applications of the invention, and that modifications and additions may be introduced without in any way departing from the spirit of this invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of moulding concrete products by the employment of rubber or material having similar properties for the moulding surfaces, according to which the reduction in the thickness of the rubber under the tension of withdrawal or the small determined contraction of a core or other part in the absence of supporting means is utilised for obtaining sufficient clearance to permit separation of the moulding and moulded surfaces by parallel or sliding movement without damage thereto.

2. A method as claimed in Claim 1 or apparatus for operating in accordance therewith in which holes or recesses are formed in concrete products by means of cores or the like formed of rubber or like tubes or other members supported upon removable rods or other members.

3. A method or means of forming hollowed, recessed or perforated concrete products, according to Claim 1 or 2, in which a mould or formwork is provided with one or more cores formed of hollow rubber supported by removable members adapted to preserve the contour of the core and after casting and removal of the support the core is withdrawn axially so that con-

traction under tension results in a ready separation from the concrete without damage to the surface thereof.

4. A method or apparatus according to  
5 any one or more of the preceding claims,  
according to which a cavity, a hollow or  
the like having internal dimensions  
slightly exceeding the dimensions of a  
mouth or opening thereto is formed by a  
10 rubber core member, which may be con-  
tracted by the tension of withdrawal  
sufficiently to effect its removal through  
the restricted opening.

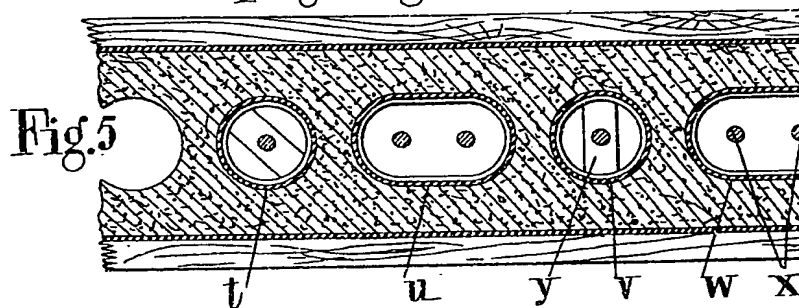
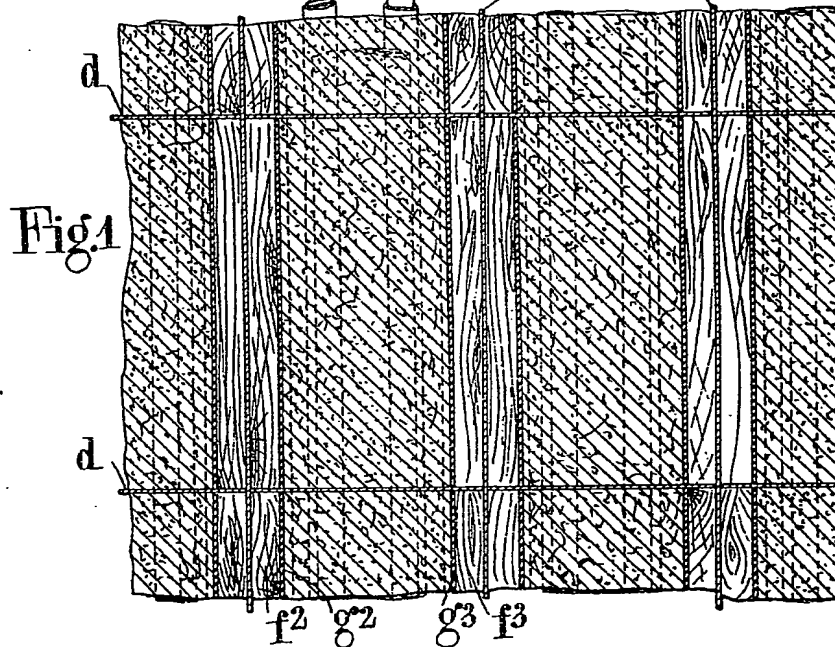
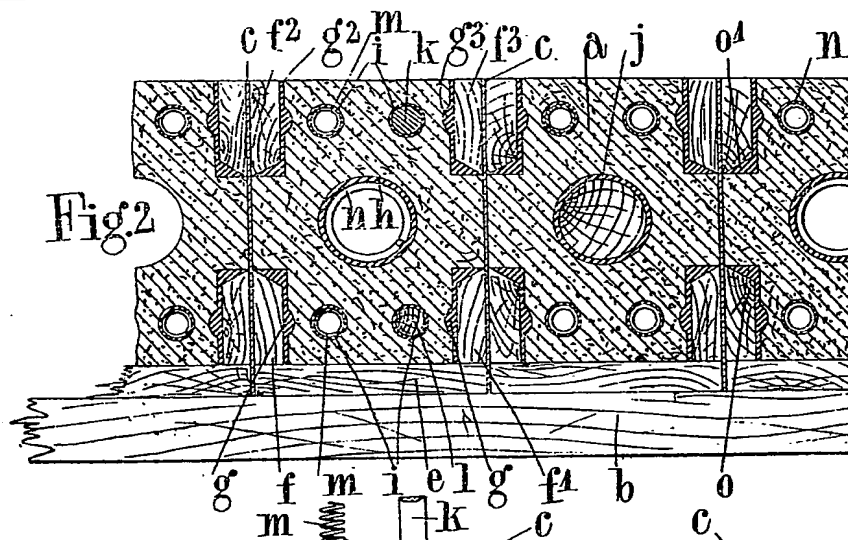
5. A method of forming pipes, drains,  
15 sewers or other conduits, according to  
Claim 1, in which a channel, trench or  
the like adapted to determine the exterior

proportions of the concrete is provided  
with a core comprising a rubber mould-  
ing surface in combination with contour 20  
determining means such as a coiled wire  
or other form or internal pressure resist-  
ing, non-extendable lining, adapted to  
maintain a predetermined size until con-  
tracted for removal in an axial direction. 25  
6. Improvements in or relating to the  
moulding of concrete products, structures  
or the like, substantially as described with  
reference to Figures 1 and 2, 3 and 4, 5  
or 6 of the accompanying drawings. 30

Dated this 12th day of March, 1920.

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[This Drawing is a reproduction of the Original on a reduced scale.]



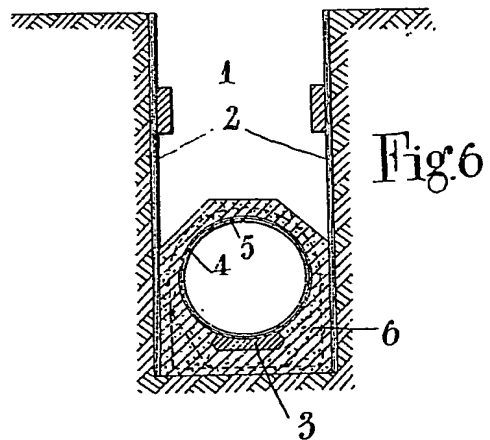
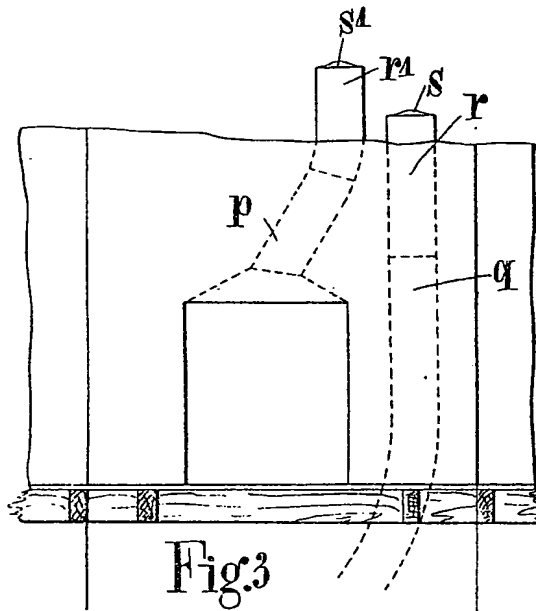
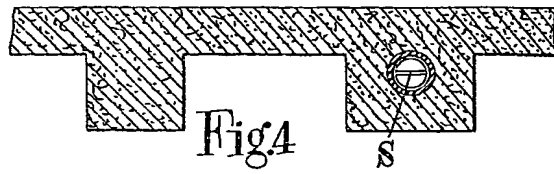
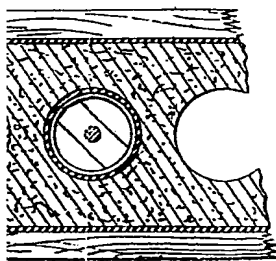
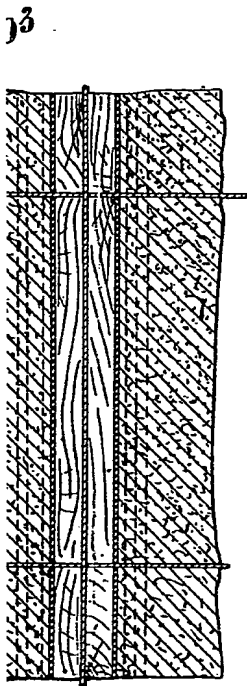
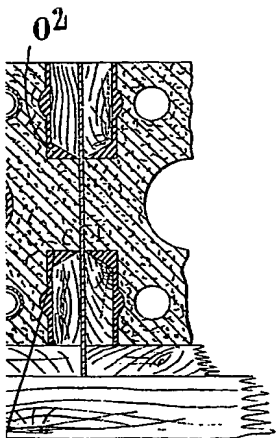




Fig. 1

Fig. 2: A perspective view of a rectangular plate with a grid of circular holes. The plate is labeled with 'a' at the top and bottom edges, 'b' on the right edge, and 'c' on the left edge. The holes are arranged in a grid, with some labeled 'd' and 'e'. The plate is shown with a cross-section 'a-a'.

Fig. 3: A perspective view of a rectangular plate with a grid of circular holes. The plate is labeled with 'a' at the top and bottom edges, 'b' on the right edge, and 'c' on the left edge. The holes are arranged in a grid, with some labeled 'd' and 'e'. The plate is shown with a cross-section 'a-a'.

Fig. 4: A perspective view of a rectangular plate with a grid of circular holes. The plate is labeled with 'a' at the top and bottom edges, 'b' on the right edge, and 'c' on the left edge. The holes are arranged in a grid, with some labeled 'd' and 'e'. The plate is shown with a cross-section 'a-a'.

Fig. 5: A perspective view of a rectangular plate with a grid of circular holes. The plate is labeled with 'a' at the top and bottom edges, 'b' on the right edge, and 'c' on the left edge. The holes are arranged in a grid, with some labeled 'd' and 'e'. The plate is shown with a cross-section 'a-a'.

Fig. 6: A perspective view of a rectangular plate with a grid of circular holes. The plate is labeled with 'a' at the top and bottom edges, 'b' on the right edge, and 'c' on the left edge. The holes are arranged in a grid, with some labeled 'd' and 'e'. The plate is shown with a cross-section 'a-a'.

Melbydt Sons, Photo Litho